

## CLAIMS:

1. A method of forming a tunneling magnetoresistive head, the method comprising:
  - forming a tunneling magnetoresistive stack having a tunnel barrier;
  - forming a surface of the tunneling magnetoresistive stack;
  - ion etching the surface causing deficiencies of a constituent of the tunnel barrier in a portion of the tunnel barrier adjacent the surface; and
  - replenishing at least a portion of the constituent in the portion of the tunnel barrier adjacent the surface.
2. The method of claim 1, wherein replenishing the constituent comprises subplanting the constituent into the surface during ion etching.
3. The method of claim 1, wherein replenishing the constituent comprises exposing the surface to a constituent source after ion etching.
4. The method of claim 1, wherein forming a tunneling magnetoresistive stack having a tunnel barrier comprises forming a tunnel barrier from a material selected from the group consisting of oxides of Hf, Ta, Nd, Ti, Mg, Al, Y, Zr, and Si.
5. The method of claim 1, wherein forming a tunneling magnetoresistive stack having a tunnel barrier comprises forming a tunnel barrier of an oxide.

6. The method of claim 1, wherein forming a tunneling magnetoresistive stack having a tunnel barrier comprises forming a tunnel barrier of a nitride.
7. The method of claim 1, wherein forming a tunneling magnetoresistive stack having a tunnel barrier comprises forming a tunnel barrier of an oxynitride.
8. The method of claim 1, wherein ion etching the surface and replenishing the constituent occur simultaneously.
9. A method of forming a tunneling magnetoresistive head, the method comprising:
  - forming a tunneling magnetoresistive stack having a tunnel barrier;
  - forming a surface of the tunneling magnetoresistive stack; and
  - ion etching the surface in the presence of a constituent source to replenish a constituent of the tunnel barrier in a portion of the tunnel barrier adjacent the surface.
10. The method of claim 9, wherein ion etching the surface in the presence of a constituent source comprises ion etching the surface in the presence of oxygen.
11. The method of claim 9, wherein forming a tunneling magnetoresistive stack having a tunnel barrier comprises forming a tunnel barrier of an oxide material.

12. A method of forming a tunneling magnetoresistive head, the method comprising:
- forming a first ferromagnetic layer;
  - forming a tunnel barrier on the first ferromagnetic layer, the tunnel barrier;
  - forming a second ferromagnetic layer on the tunnel barrier;
  - lapping the first ferromagnetic layer, tunnel barrier, and second ferromagnetic layer to form a surface;
  - ion etching the surface causing a deficiency of a constituent of the tunnel barrier in a portion of the tunnel barrier adjacent the surface;
  - replenishing the deficiency of the constituent in the tunnel barrier adjacent the surface.
13. The method of claim 12, wherein replenishing the deficiency of the constituent comprises restoring at least one electrical property of the tunnel barrier.
14. The method of claim 12, wherein forming a tunnel barrier on the first ferromagnetic layer comprising a constituent comprises forming a tunnel barrier on the first ferromagnetic layer comprising an oxide.
15. The method of claim 12, wherein forming a tunnel barrier on the first ferromagnetic layer comprising a constituent comprises forming a tunnel barrier on the first ferromagnetic layer comprising a nitride.

16. The method of claim 12, wherein forming a tunnel barrier on the first ferromagnetic layer comprising a constituent comprises forming a tunnel barrier on the first ferromagnetic layer comprising an oxynitride.

17. The method of claim 12, wherein ion etching the air bearing surface and replenishing the deficiency of the constituent occur simultaneously.

18. The method of claim 17, wherein replenishing the deficiency of the constituent comprises restoring at least one electrical property of the tunnel barrier adjacent the air bearing surface.

19. A tunneling magnetoresistive head, formed according to the method of claim 12.